HEILBRONN UNIVERSITY
OF APPLIED SCIENCES

Faculty of Engineering - List of English lectures

Lectures may vary, and are not offered every semester.
Valid from Summer Semester 2026

English lectures are held in all study programs, and can be attended by all interested students. There are **Bachelor** and **Master** (may be visited by advanced Bachelor as well) lectures listed below. Unless explicitly stated otherwise, the lectures are offered in both summer and winter term.

Study programs offered by the Faculty of Engineering

ILIAS registrations are valid only for enrolled students. URL may change. In our university, it is not possible/necessary to register for classes. Registration is only necessary for exams. Registration period is announced in the academic calendar (approx. mid of semester). ILIAS links give access to the course materials and information about changes as well as for submitting assignments if necessary.

You can contact the Professor by sending him/her an Email. The adresses can be found on the top right search button at this webpage: https://www.hs-heilbronn.de/en

BACHELOR
Automotive Systems Engineering (ASE): No. 302… (SPO 2), No. 304… (SPO 3), No. 610…(SPO4)
Electrical Systems Engineering (ESE): No. 194…(SPO 1), (SPO2), No. 605 (SPO2)
Mechanical Engineering (MB): No. 112… (SPO 2), No. 114… (SPO 3), No. 612… (SPO4)
Mechatronics and Micro Systems Engineering (MM): No. 132 …(SPO 2)
Mechatronics and Robotics (MR): No. 134…(SPO 1), (SPO 2) No. 607…(SPO4)
Manufacturing and Operations Management (PPM) No. 123…(SPO 2)
Environmental and Process Engineering: (UP) No. 235… (SPO 1), No. 606…(SPO2)
Ingenieurinformatik (IIE) No. 195… (SPO 1)
Intelligent Mechatronic Systems No. 609…(SPO1)
Artificial intelligence and industrial digitalization No. 608… (SPO1)
Technical Management No. 611…(SPO1)

MASTER
Mechanical Engineering (MMA) No.115…(SPO 4), No. 6160..(SPO5)
Mechatronics and Robotics (MME) No.135…(SPO 2), No. 6165..(SPO3)
Electrical Systems Engineering (MES) No.265…(SPO 1), No. 6155.. (SPO3)
Automotive Systems Engineering (MAS) No. 305…(SPO 1), No. 6151(SPO3)
Technical Management (M.Sc.) (MTM) No. 320….(SPO 3)

Exam indicates the method of examination. LKBK = Various tests during semester; LL = practical exam in lab; LK = written exam; LR = oral presentation; LA = practical work; LM = oral exam, PK = inter-course exam, BTh= Bachelor Thesis

*Disclaimer: Please note that the information in this list serves as a guide. For example, the titles of the subjects may differ slightly from your Transcript of Records due to translation differences. Please double-check the subjects' information on the online platform when creating your schedules and registering for your exams at the beginning of the semester. *tbd = to be decided*

Contact: te-international@hs-heilbronn.de

Bachelor **(only in winter)**	No.	ECTS	Exam	Instructor	Content
Basic Studies (1st Year)					
Programming 1 (MR1 English)	194531 / 605561 (ESE) 134531 /	5	LK	Prof. Ipek Sarac-Heinz	• History of Computers & Computer Science • Basics of numeral systems • Data types, constants and variables • Control structures (if, if-else, switch-case, while, for etc.) • Functions, Scoping rules, Array, structs

	607561 (MR)				
Electrical Engineering and Electronics 1	607541 (MR)	5	LK	Prof. Tim Fischer	• Basic quantities of electrical engineering • Direct current circuits • Simple methods for network calculation and analysis • Electric field and capacitor • Magnetic field and coil • Applications of direct current technology
Engineering Mechanics 1 ((IMS1 – English Program)	607581 (MR)	5	LK	Prof. Georg von Tardy-Tuch	• Introduction (force and moment) • Equilibrium of rigid bodies • Determination of the center of mass • Static and kinetic friction • Internal forces and moments • Stress and strain (plain stress, main stress, stress-strain diagram, influence of heat)
Main Studies (from 2nd year)					
Dynamic Image Processing ASE 3 (Dynamische Bildverarbeitung)	304278 / 609321	5	LK	Prof. Raoul Zoellner Prof. Nicolaj Stache	• Introduction to image processing • State and technology • Examples of use • System design and components (cameras, optics, lighting, computers) • Image acquisition (sampling, storage, encoding, data reduction, mathematical description) • Image preprocessing (image improvements, filters, restoration) • Image processing, segmentation Feature extraction, classification Motion estimation, depth estimation, stereo vision. Applications, boundary conditions, trends
Metal Forming Technologies (can only be taken in combination with 114152 /612321 “Spanende und Abtragende Fertigungsverfahren” in German) (Umformende Fertigungsverfahren) (MB3)	114153 / 612322	2	PK	Prof. Arndt Birkert	Teaching the fundamentals of metal forming manufacturing technologies in terms of materials and processes. Special emphasis is placed on conveying a fundamental understanding of the procesf262142 s.
Bachelor **(only in summer)**	No.	ECTS	Exam	Instructor	Content
Basic Studies (1st Year)					
Programming 2 (MR2 English)	605571 (ESE) 607571 (MR) / 134532 194534	5	LK	Prof. Ipek Sarac-Heinz	• Headers and libraries, how to define a header file • Call by value/call by reference•Pointers • String functions • Complex data types (e.g. structs) • Linked lists (singly and doubly) • Adding, removing, sorting for linked lists •
Materials: Metals (can **only** be taken in combination with course “Materials: Plastics” 607601)	607602 (MR) / 134571	2,5	PK	Prof. Marc Wettlaufer	• Basic Concepts of Physical metallurgy • Heat treatment • Iron and non-iron materials • Deformation, plasticity • Extraction and recycling • Materials testing, failure analysis

Materials: Plastics (can **only** be taken in combination with course "Materials: Metals" 607602) (MR2 English)	607601 (MR) / 134572	2,5	PK	Prof. Uwe Gleiter	Plastic Materials • polymer reactions • structure of polymers • mechanical behaviour • applications
Electrical Engineering and Electronics 2	607551 (in combination with 607552) (MR)	2,5	LK	Prof. Tim Fischer	• Switching operations in DC networks • Alternating current (AC) • Complex phasors • AC networks • Semiconductor elements
Lab Electrical Engineering	607552 (in combination with 607551) (MR)	2,5	LA	Prof. Tim Fischer	• Experiments in DC and AC engineering • Introduction to basic electronics (diodes, Transistors, OpAmps)
Engineering Mechanics 2 (IMS2 – English program) (from Summer 2026)	607591 (MR)	2,5	LK	Prof. Georg von Tardy-Tuch	•
Engineering Mechanics 3 (IMS2 – English program) (from Summer 2026)	607592 (MR) 609092 (IMS)	2,5	LK	Prof. Timo Hufnagel	• Kinematics of a point - Coordinate systems - Position vector, velocity, acceleration, motion diagrams • Kinematics of rigid bodies - Planar motion: pure translation, pure rotation - The instantaneous pole • Fundamentals of kinetics - Basic kinetic concepts: momentum, spin - Return to statics • Law of conservation of momentum, law of conservation of angular momentum - Plane moments of inertia - Moment of inertia when changing the reference system - Equations of motion for plane systems • Law of conservation of energy
Main Studies (from 2nd year)					
Image Processing 2 ESE 6 (Bild Verarbeitung 2)	194302	5	LA	Prof. Dieter Maier Option of Recognition: • Computer and Robotic of Vision • Image Processing 2 (Please contact Prof. Maier)	Requires basic knowledge of computer vsion • local filters, blurring filters, edge filters, Bandpass filters, non-linear filters • geometric objects • Edge detection: Harris-Operator, Hough-Transformation: Line & circle detection • Segmentation, adaptive threshold detection, morphologic filter, object extraction • Object features, geometrical features with geometrical invariances, signature features, correlation methods
Chemical Engineering Laboratory (UP 3) can only be taken with a proven chemical background) (Labor Chemische Reaktionstechnik)	235325 / 606242	2,5	LA	Prof. Katja Mannschreck	• Organic synthesis incl. processing of the product by recrystallization and distillation • Experimental determination of reaction kinetics • Calorimetric determination of reaction heats • Electrochemical experiments

Computational Fluid Dynamics (CFD) 1	612703	5	LK	Prof. Dr.-Ing. Jennifer Niessner	• Overview of the range of applications for CFD • Conservation equations • Turbulence • RANS and turbulence models • Discretisation in space and time • Numerical solution • Error analysis • Post-processing, evaluation • Application to practical fluid dynamics tasks in mechanical engineering
Intelligent Systems (Sem. 4) (In conjunction with double-degree program HHN-VGU) (IIT6 technisches Fach der Fakultät)	195316	5	LK	Prof. Dr. Marco Wagner	This lecture provides an introduction into Artificial Neural Networks and Deep Learning. It presents the foundation of Artifical Neural Networks and their training as well as established Deep Learning methods such as CNNs and Autodencoders. Prerequisites: A basic understanding of Machine Learning (ML) (e.g. supervised vs. unsupervised learning) an understanding of basic ML techniques such as Classification, Decision Trees, Regression and Clustering first hands-on experience in ML using Python
Bachelor (Winter/Summer)	**No.**	**ECTS**	**Exam**	**Instructor**	**Content**
Methods of AI (IIT 4) (Methoden der KI)	195181	2.5	LKBK	Prof. Marco Wagner	This lecture gives an overview on different AI methods, both in theory and hands-on. No previous knowledge needed, Python skills are an advantage • Introduction into Artificial Intelligence (AI) • Knowledge-based Systems • Data in AI • Introduction into Machine Learning • Decision Trees and Random Forests • Clustering • Regression • Classification • Neural Networks & Deep Learning
Multi-body Dynamics Simulation ASE 6 (Mehrkörpersimulation)	304281 / 610…	5	LKBK	Prof. Klaus-Dieter Leimbach	• Orientation of a rigid body in space (Bryant angles, Euler angles) • Cinematic differential equation of the angular velocities in space • Equations of motion of an unconstrained rigid body in space • Modeling of passive and active force elements • Equations of motion of unconstrained rigid body systems in space • Equations of motion of a constrained rigid body in space • Equations of motion of constrained rigid body systems in space • Modeling spatial joints
Laboratory Multi-Body-Systems (will be recognised as “Selected Topics ASE” / “Ausgewählte Kap. ASE)	304291 / 610…	2,5	LA / LK	Prof. Klaus-Dieter Leimbach	Laboratory Multi-Body-Systems: • Handling of commercial rigid body simulation software • Definition of coordinate systems • Entering of rigid bodies (inertia parameters, local coordinate systems) • Entering of force elements (passive, active components)

					• Definition and input of joints • Choice of suitable integration routines • Output of the generated simulation results in time histories
Powertrain ASE 6 (Antriebsstrang)	304280	5	LK	Prof. Hermann Koch-Gröber	• Powertrain systems introduction, Vehicle driving conditions revisited • Test cycles, procedures, emission limits, immissions • Energy storage and conversion in batteries, fuel cells • Chemical reactions mass and energy balances, air to fuel ratio • Internal combustion engine operation basics: indication, mean pressures, combustion process features • Engine management such as Injections systems and functions, injectors • Hybrid vehicles, driving strategies, fuel and range economy
Laboratory Drive Train (will be recognised as “Selected Topics ASE” / “Ausgewählte Kap. ASE) To take this, the attendance at “Powertrain Lectures 304280 above is mandatory”	304291	2,5	LA	Prof. Hermann Koch-Gröber	Laboratory Drive Train: Projects in groups of 2 or 3 students introducing a commercial simulation tool on simulation of hybrid powertrain operation within driving vehicle focusing on fuel consumption, result interpretation in short written report
Microcontroller ASE 3 (Mikrocontroller)	304132	3	LKBK	Prof. Ansgar Meroth, M.A. Petre Sora	• Architecture of Microcontrollers • Programming in embedded C • Digital and analog IO of the AVR family • Interrupts of the AVR family • Timers of the AVR family • Serial communication (UART, SPI, TWI/I2C) Lecture includes a project
Automotive Embedded Systems ASE 6 (Embedded Systems im Kfz)	304272	5	LKBK	Prof. Raoul Zoellner	Students learn the principles and standards of realtime operation systems with focus on automotive systems. Further topic is the implementation of realtime functions on micro controller. Requires advanced C programming
Laboratory electrical engineering (Electronic Systems Lab) ASE 6 (Projekt Labor - Elektronische Systeme)	304275	5	LL	Prof. Ansgar Meroth M.Eng. Pascal Keller	Project work in a team with presentations. Requires project management knowledge, and programming and electronics skills.
Human Machine Interaction ASE 6, ASE 7	304277	2.5	LA	Prof. Meroth	• Media technology • Displays • Car-Multimedia • Perception • User Centered Design Process • HMI Evaluation • Media design • Prototyping (includes a team project)
Modelling MR 6 (Modellbildung)	134308	2,5	LK	Prof. Markus Scholle	• Introduction on PDE: historical overview, terms, definitions

					• Physical problem formulation: Nabla calculus, Continuum and Fluid Mechanics, Maxwell equations, Heat transport, associated boundary conditions • Mathematical problem formulation: Dimensional analysis, non-dimensional numbers, Potentials • Finite Differences: Formulation, Implementation with Python, Accuracy, Neumann boundary conditions, Stability analysis • Finite Elements: Variational Calculus, Given and Natural boundary conditions, Ritz's direct method, Implementation with Python, FEM
Digital Signal Processing MR 6 (Digitale Signalverarbeitung)	134682 / 607282	2,5	LK	Prof. Peter Ott	• Continuous Signals und Systems: Fourier-Transform, Laplace-Transform (Repetition) • Sampled Systems and Signals, Z-Transform • Discrete Fourier-Transform • FIR-Filter • MATLAB-Examples
Internal Combustion Engines MB 4 (Verbrennungsmotoren)	114290 / 612715	5	LK	Prof. Karsten Wittek	• The role of internal combustion engines for the decarbonizing of the transport sector • Regenerative fuels, H2, Bio-ethanol, e-Fuels • 4-stroke working process, work diagram, stroke function, engine designs • Design and operating parameters • Ideal models for engine cycles • Combustion process in spark-ignition engines • Special aspects of hydrogen combustion • Gas exchange process • Engine mechanics and engine design
Term paper/ project MM6, ASE 6 (Seminararbeit / Projekt)	302191 /304171 132221 / 134161	8	LA	Various Professors.	This is a 200 hrs research project assigned in an actual research program upon individual contract. The project can be performed in a team and should be completed within one semester. The project includes a seminar presentation and a written report.
Model-Based Software Engineering (ASE 6) (For 6th Semester Students) (Modellbasierte Softwareentwicklung)	304274	5	Project	Prof. Frank Tränkle	• Application of model-based software engineering • Vehicle dynamics simulation • Motion control design including speed control, longitudinal position control, path following control • Modeling, simulation and code-generation of ROS nodes in MATLAB/Simulink • Working in project teams Requires experiences in MATLAB/Simulink, control theory, dynamical systems simulation
Sustainability Project Week (can only be taken or chosen in combination with "Sustainability Live! 235082 / 606111". Registration for 235081/ 606112 is done during the lecture of "Sustainability Live!" (Projektwoche Nachhaltigkeit)	235081 / 606112	2,5	LA	Prof. Jochen Haas, Prof. Katja Mannschreck	• Project work in teams on a given technical problem with special emphathis on sustainability aspects. • Knowledge from the Sustainability Live lecture is applied here in theory and practice. Literature survey, scientific discussions, organisation within the team, and presentation of results will be accompanied by the coaches.

Sustainability Live! (UP 1) (Nachhaltigkeit Life)	235082 / 606111	2,5		Prof. Jochen Haas, Prof. Katja Mannschreck	• Present environmental problems and topics • Political measures, international and national actors of sustainable development • Sustainability as a concept, strategies for sustainable development • Basics of life cycle analysis, application on technical systems • Basics of industrial ecology
Lean Production TEM4	611211	5	LK	Prof. Patrick Balve	The lecture focuses on the practical relevance and application of the principles and methods of the lean manufacturing approach. Specifically, the lecture will present about 20 very concrete methods that revolve around the following topics: • Identifying and eliminating waste (Muda) • Just-in-time production (Kanban) • Fast machine changeover (SMED), OEE • Value stream mapping and improvement • Zoning and 5S • Jidoka, quality and process stability through standardisation • Continuous improvement (Kaizen) and leadership Successful Lean implementation strategies are also discussed in the context of general change management models.
Practice-oriented module “Learning Factory” (Lernfabrik) PPM 6 **(The number of ECTS credits earned - either 5 or 7 or 15 - depends on your agreement with the professor and your actual involvement in the overall semester project.)** (Praxismodul Lernfabrik)	123231	5, 7 or 15	LA	Prof. Patrick Balve et al.	The Heilbronn Learning Factory is a large-scale student project based on the problem-based learning approach. The main objective of each Learning Factory course is to design and manufacture a broadly specified product within time and budget constraints. The product itself varies from semester to semester. The activities undertaken by the students cover a wide range of industrial-like activities, starting with prototyping and product design, through production engineering issues and quality management, to parts manufacturing and product assembly. At the start of the project, students are asked to choose their functional specialisation. Due to the interdisciplinary nature of the course, the projects are supervised by a team of professors. **Important information for exchange students Please contact the lead supervisor, Prof. Balve, in good time (i.e. ahead of your arrival at Heilbronn) to find out whether your individual level of knowledge is suitable for participation in the Learning Factory!** Please also note that there are a number of scheduled dates throughout the semester where attendance is mandatory.
Applied Studies PPM7 (Angewandte Studie)	123271	7,5	LA	Various lecturers	This project focuses on a posted or self-chosen academic topic which is to be worked on individually. The project should be completed within one semester term.
Bachelor Thesis UP PPM ASE MR	123281 (PPM) 235902 (UP) 304261 (ASE) 134761 (MR)	12	BTh	Various lecturers	The bachelor’s thesis is preferably carried out at a manufacturing company based on a real-life engineering or manufacturing topic. While solving the respective assignment, the student demonstrates his or her ability to successfully apply engineering methods and knowledge. The thesis has to be completed within a timeframe of 4 months. Bachelor theses can also be

					conducted in a lab of the university upon agreement with a professor.
Colloquium to Bachelor Thesis PPM (Kolloquium Bachelor Thesis) UP (Kolloquium)	123282 (PPM) 235903 (UP)	3	LR	Various lecturers	Presentation of Bachelor Thesis Content.
Student Project 123181 (PPM 4) Project Work 235316 (Projektarbeit) UP PPM	123181 (PPM 4) 235316 (UP)	5 up to 12,5		On Demand Contact Prof. Georg Pisinger for UP or Prof. Patrick Balve for PPM	Research project assigned in a current research programme through individual contact. The project may be carried out in a team and should be completed within one semester. The project includes a seminar presentation and a written report.
Industrial Internet of things 1 (IIoT Sys 1) MR1 TEST (In conjunction with double-degree program HHN-VGU) (IIT4/IIoT1)	195264	2,5	LA	Prof. Carsten Wittenberg	Network Technologies and Protocolls for Industrial Sensor and Actuator Networks
Industrial Internet of things 2 IIoT Sys 2) MR1 TEST (In conjunction with double-degree program HHN-VGU) (IIT6/IIoT2)	195265	2,5	LA	Prof. Carsten Wittenberg	Network Technologies and Protocolls for Industrial Sensor and Actuator Networks
Autonomous and Safe Systems 1 A&SafeS1 (In conjunction with double-degree program HHN-VGU)	195301	2,5	LA	Prof. Frank Tränkle	• Application of model-based software engineering • Vehicle dynamics simulation • Motion control design including speed control, longitudinal position control, path following control • Modeling, simulation and code-generation of ROS nodes in MATLAB/Simulink • Working in project teams Requires experiences in MATLAB/Simulink, control theory, dynamical systems simulation
Master (only in winter)	No.	ECTS	**Exam**	Instructor	(may be visited by advanced bachelor students as well)
Machine Learning and Computer Vision MMA , MMR , MEL , MAS	115591 135441 265441 305482 615956	5	LA	Prof. Dieter Maier	• Feature identification • Gauß-Laplace Pyramid • SIFT features • SURF and other features • Matching- Algorithms: Brute-Force-Matcher • Classification and machine learning: SVM, kmeans, etc. • 3D-Features and recognition processes, e.g: Kalman-Filter; temporal tracking, Algorithms for autonomous motion: SLAM-Algorithm, uv-Histogram
Autonomous Systems: Architecture and Planning	115587 135490	2,5	LKBK	Prof. Raoul Zoellner	• Introduction to autonomous systems • Architectures of autonomous systems

MMA , MMR , MEL , MAS	265492 305445 615456				• Characteristics, strengths & weaknesses of different set-ups • Planning
Digital Signal Processing and Pattern Recognition MMR, MEL, MAS (Digitale Signalverarbeitung und Mustererkennung)	135497 265446 305450 615461	5	LA	Prof. Volker Stahl	Sampling and Aliasing, D/A Conversion, Modulation, Digital Filters, Fast Fourier Transform, Fast Convolution
Autonomous Systems: Reinforcement Learning MMA, MMR, MEL, MAS	115589 135445 265494 305447 615459	5	LA	Prof. Frank Tränkle	• Definition and classification of driver assis-tance systems and automated driving • Sensors for ADAS: complementary and concurrent measurement methods and signal processing • Longitudinal and lateral control • Trajectory planning and control • Requires knowledge in control theory and system dynamics simulation •
Product Strategy and Brand Management (MTM1)	320212	4	LK	Annette Allweil	• Customer-Based Brand Equity Framework • Building Brand Equity • Measuring Brand Equity • Customer Analysis • Customer-Based Brand Equity • Integrated Marketing Communications •
Advanced Topics in Project Management (To be taken in combination with 999062) (MTM1)	999061	2,5	LR	Prof. Patrick Balve	• Master hybrid methodologies, lean principles, and critical chain theory • Understand PMO structures and organizational integration • Learn project management's role in organizational change • Develop knowledge of team dynamics and stakeholder psychology • Manage stakeholder relationships and facilitate distinguished meetings • Apply AI tools in project managementJoint exam with Intercultural Management • Presentation at the end of the course (see below 999062). • Prerequisite: Basic background in traditional and agile project management
Intercultural Management (To be taken in combination with 999061) (MTM 1)	999062	2	LR	Prof. Rolf Blumentritt	• Comparative cross-cultural management • Corporate culture and employee behaviour • Manage workforce diversity • Global teams • International projects • Motivation and performance management • Leadership styles • Negotiation in an international context • Presentation at the end of the course (see above 320261).
Selected Topics in Applied Research MMA, MMR, MEL, MAS	115610 135511 265509 305509 616970	2,5	LK	Prof. Koch-Gröber Prof. Jennifer Niessner	Current research topics from various fields of the faculty. This includes, for example, 3D printing, flow simulation, surface technology etc.

Advanced Suspension Systems MMA, MMR, MEL, MAS	115581 135483 265483 305442 615452	2,5	LA	Prof. Georg von Tardy-Tuch	• Material considerations • Kinematic suspension design • Dynamic suspension elements • Elastokinematic elements • Kinematic vehicle behavior • Kinematic suspension analysis
Embedded AI from WS 26/27	615463	5	LKBK	Prof. Marco Wagner	Advanced lecture on how to create AI algorithms for embedded Systems: • Model optimization and compression are important measures in order to allow efficient execution of neural networks, especially in resource-constrained embedded systems. • Furthermore, additional hardware elements and software frameworks for embedded AI are discussed, both in training and inference. Prerequisites: • Understanding of Machine Learning (ML) • Understanding Artifical Neural Networks and Deep Learning Models (e.g. CNNs, Autoencocer, …) • hands-on experience in ML using Python, C/C++ experience is beneficial
Master **(only in summer)**	**No.**	**ECTS**	**Exam**	**Instructor**	**(may be visited by advanced bachelor students as well)**
Industrial Processes in Materials Engineering MMA, MMR, MEL, MAS	115551 135504 265502 305502 616458	2,5	LK	Prof. Marc Wettlaufer	Typical product generation processes in Materials Engineering, such as simultaneous engineering, parallelization, project management in materials engineering, systematic materials selection, purchasing, development, manufacturing, acquisition, sales, standardization, specification
Lightweight Car Body Engineering MMA, MMR, MEL, MAS	115552 135508 265504 305504 616459	2,5	LK	Prof. Arndt Birkert	Basics car body structures and principle design concepts Requirements to the body and body components: • dimensional requirements • structural requirements • surface/optical requirements • other functional requirements Body components (structural components, outer skin) Lightweight aspects: • lightweight body materials • lightweight design structures Body development process Component production process Assembly processes and joining technologies Body quality aspects and measuring technologies
Autonomous Systems: Perception and Situation understanding MMA, MMR,	115590 135492 265495 305448	5	LA	Prof. Raoul Zoellner/ Prof. Nicolaj Stache	• Overview on Advanced Driver Assistance Systems and automated driving • Sensors for perception of environment

MEL, MAS	615458				• Calibration: sensors as measuring tools, Transformation of sensor data • Recording 3D data and movements • Object identification in sensor data • Object-Tracking
Autonomous Systems: Deep Learning MMA, MMR, MEL, MAS	115588 135491 265493 305446 615457	5	LA	Prof. Nicolaj Stache	• Introduction to deep learning and differences to AI and machine learning • Tools for data processing • Convolutional Neural Networks (object recognition in images) • Recurrent neural networks (language recognition) • Generative adversarial networks

Optical Sensors
MMA, MMR,
MEL, MAS
 	
(Optische Sensorik)
	115607
	135450
	265453
	305506
	616963
		5	LA	Prof. Peter Ott	• Systems Theory of Optical Imaging
					  • Basics of diffraction
					  • Discrete Fourier transform for simulating optical diffraction and imaging
					  • MATLAB examples and assignments
					  • Point spread function of optical imaging
					  • Optical transfer function of optical imaging
					  • Measurement methods of the transfer function
					  • Lab experiment (measurement of the transfer function of a camera)
					• Optical Metrology for Production
					  • Introduction in Metrology for Production
					  • 2D camera metrology
					  • Triangulation methods
					  • Time-of-flight methods
					  • Interferometry
					  • Lab experiment (camera calibration)

Exhaust (gas) treatment MMA, MMR, MEL, MAS (Abgasnachbehandlung)	115541 135481 265481 305441 616451	2,5	LK	Prof. Hermann Koch-Gröber	• Component and system functions of particulate filters and NOx-reduction by SCR and storage catalysts, gasoline 3-way-catalysts • Principles of exhaust gas legislation for the collaboration with system and motor developers • Basics of kinetics of chemical reactions and their catalysis • Basics of substrates and body characteristics
Lab Exhaust Gas Treatment MMA, MMR, MEL, MAS (Labor Abgasnachbehandlung)	115604 135506 265503 305453 615467	2,5	LA	Prof. Hermann Koch-Gröber	Applying commercial SW GT suite to system functions, incl. parameter variations Parallel or prior attendance of lecture EGT required
Industrial Robotic Vision Systems Ausgewählte Kapitel Robotik MMA1 Master, MMA2, MMR1 Master, MMR2	135444	5	LKBK LK	NN	Robots are widely used in industrial automation processes to perform tasks that require high precision, repeatability, and frequently in unsafe human conditions. The topics covered in this course will enhance student's understanding of industrial robotic vision systems to improve the automation processes and production throughput. Concepts of optics needed for robotic vision systems' design, development and integration are also covered in the course. Theoretical aspects of the industrial robotic vision systems are reinforced utilizing FANUC Roboguide Simulation Software with iR-Vision 2D setup. To deepen the knowledge of current technologies used in the field of industrial

					robotic vision systems, master students are required to select, read and comprehend at least one journal or conference research article bi-weekly and submit a comprehensive technical report.
Composites MMA, MMR, MEL, MAS	616954	2,5	LK	Prof. Uwe Gleiter	
Advanced Modelling and Simulation (from Winter 2026 / Summer 2027) (IMS Master, MMA, MMR, MEL, MAS)	tbd	2,5	LA	Prof. Markus Scholle	• Mathematical foundations • Scalar, vector and tensor fields • Physical balance equations in fluid and solid mechanics, Maxwell equations • Dimensional analysis, non-dimensional numbers, similarity solutions • Potential fields, Green's function methods • Variational calculus of fields, Noether's theorem, second variation • Ritz's direct method • Numerical methods
Advanced Control Engineering	616974	2,5	LK	Prof. Ipek Sarac-Heinz	• Controllability and Observability • State Space Controllers • State Observers • Linear Quadratic Regulators
Master (Winter/Summer) (may also be visited by advanced bachelor students)	No.	ECTS	Exam	Instructor	Content
Numerical Methods and Optimization MMR, MEL, MAS (Numerische Methoden / Optimierungsmethoden)	135416 265416 305416 616901 615901 615401	2,5	LA	Prof. Ott	Numerical Methods: • Numerical Differentiation • Interpolation • B-Splines • Numerical Integration • Root Finding • Ordinary Differential Equations Optimization: • Linear Least-Square Problems • Nonlinear Least Square Problems • Learning Algorithm for Neural Networks
Design of Experiments MMA2, MMR2, MEL2, MAS2	115513 135413 265413 305413 616402 616904 615904 615404	2,5	LK	Prof. Carsten Pargmann	• Statistical analysis • Experim1ntal methods • Factorial design of experiments • Optimisation of experiments
Engineering Project MMA, MMR, MEL, MAS	616060 615560 615060 616560	15		On Demand	• Research work in a lab Please contact the Faculty's International Office Coordinator
Statistical methods	616401 616902 615902 615402	2,5	LK	Prof. Dr. rer. nat. Priska Jahnke	Introduction to regression analysis: • Probability distributions • Conditional probability distributions • Regression line and regression function • Estimation in the linear regression model

Advanced Additive Manufacturing MMA, MMR, MEL, MAS	616951	5	LK	Prof. Sebastian Schillo, Prof. Uwe Gleiter	• Develop parts for additive manufacturing from ideas to the final product • Apply state of the art methods for engineering design and the use of lattice structures • Deep dive in the Laser powder bed fusion technology or liquid deposition modelling